

REMARKS/ARGUMENTS

The Office Action mailed April 24, 2006, has been received and reviewed. Claims 1 through 8 are currently pending in the application. Claims 1 through 8 stand rejected. Claim 1 is amended herein. Reconsideration is respectfully requested.

35 U.S.C. § 102(b) Anticipation Rejections

Anticipation Rejection Based on U.S. Patent No. 6,235,557 to Manley

Claims 1 through 5 and 7 through 8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Manley (U.S. Patent No. 6,235,557). Applicant respectfully traverses this rejection, as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Manley discloses a method of forming a reproducible and reliable fuse. (Manley, Col. 3, lines 55-61). The fuse 420 is formed while bond pads are defined in an uppermost or final metal interconnect layer of a semiconductor device. (*Id.* Col. 6, lines 20-22). The fuse is formed in a second-to-last metal interconnect layer of the semiconductor device. (*Id.* Col. 3, line 66 – col. 4, line 3 and col. 5, lines 44-47). An oxide layer 430 is formed over the fuse 420 and the final metal interconnect layer 440 is deposited over the oxide layer 430. (*Id.* Col. 6, lines 2-4). Bond pads are formed in the final metal interconnect layer. (*Id.* Col. 6, lines 35-36). Another oxide layer 450 is formed over the final metal interconnect layer and a nitride layer 460 is formed over this oxide layer 450. (*Id.* Col. 6, lines 4-7). The nitride layer 450 and underlying oxide layer 450 are etched to expose the bond pads in the final metal interconnect layer. (*Id.* Col. 6, lines 48-49). The etching also removes the nitride layer overlying the fuse. (*Id.* Col. 6, lines 15-19; FIG. 2G). The resulting structure includes the fuse covered by the oxide layer, which functions as a passivation layer and provides ease and reproducibility to opening the fuse. (*Id.* Col. 6, lines 55-57 and Col. 7, lines 31-33; FIG. 2H). Wafers with this structure are subjected to probe testing

and circuit repair to replace defective memory cells with functional memory cells by opening the fuses. (*Id.* Col. 6, lines 58-63 and Col. 7, lines 24-26).

Applicants disagree with the Examiner's characterization of claim 1 as a product by process claim. Claim 1 of the presently claimed invention recites an "intermediate structure of a post-circuit repaired semiconductor device comprising: at least one open fuse structure on the intermediate structure of the post-circuit repaired semiconductor device; and a metal feature on a first metal structure of the intermediate structure of the post-circuit repaired semiconductor device, wherein a metal of the metal feature is present on the first metal structure and is not present on the at least one open fuse structure." Support for the amendment may be found throughout the as-filed specification, for example, paragraphs [0003] and [0012]. Applicant respectfully submits that Manley fails to disclose, either expressly or inherently, every element of claim 1 of the presently claimed invention. Specifically, Manley fails to disclose an "intermediate structure of a post-circuit repaired semiconductor device comprising at least one open fuse structure on the intermediate structure of the post-circuit repaired semiconductor device." Instead, Manley discloses that "[b]ecause the majority of the fuses in any memory **will not be blown**, it is desirable that they remain covered with a protective layer of oxide in order to provide a degree of mechanical and chemical protection." (Manley, col. 3, lines 2-5)(emphasis added).

Manley states that the structure, for example of FIG. 2H, **then** undergoes probe testing and circuit repair **by opening** fuses. (*Id.* at col. 6, lines 58-59). In other words, the structures disclosed in Manley are pre-probe tested and pre-repaired intermediate structures and involve closed (*i.e.*, not blown or open) fuses. Manley does not inherently or expressly disclose that his post-circuit repaired structure would be the same or an equivalent structure to the presently claimed invention. As stated in the current application, when a conventional fuse is opened or "blown," the metal or polysilicon will rapidly heat up and vaporize causing the vaporized material to be scattered and deposited, potentially proximate the blown ends of the open fuse. (Specification, paragraph [0004]). Nothing in Manley indicates that his fuse would operate other than convention.

Applicants respectfully disagree that the term “post-probe tested semiconductor device” or the substituted term “post-circuit repaired semiconductor device” is a process limitation. However, even assuming the term implies a process limitation, it imposes structural elements on the claimed semiconductor device that are not present in the intermediate device of Manley. Again, the structures disclosed in Manley are pre-probe tested intermediate structures and thus involve closed (*i.e.*, not blown or open) fuses. Manley does not inherently or expressly disclose that his post-circuit repaired structure would be the same or an equivalent structure to the presently claimed invention. As stated in the current application, when a conventional fuse is opened or “blown,” the metal or polysilicon will rapidly heat up and vaporize causing the vaporized material to be scattered and deposited, potentially proximate the blown ends of the open fuse. (Specification, paragraph [0004]). Nothing in Manley indicates that his fuse would operate other than convention.

As Manley fails to disclose, either expressly or inherently, every element of claim 1 of the presently claimed invention, Manley does not anticipate claim 1. Accordingly, claim 1 is allowable.

Claims 2-5, 7, and 8 are each allowable at least for depending, either directly or indirectly, from allowable claim 1.

Claim 2 is further allowable because Manley does not expressly or inherently describe that the metal feature is electrolessly plated. Manley merely discloses that “the final metal layer is deposited and patterned.” (Manley, col. 5, lines 50-53). Manley lacks any disclosure of an electroless plating solution or related process.

Claim 5 is further allowable because Manley does not expressly or inherently describe that the metal feature comprises a nickel, palladium, gold, tin, silver, or copper feature. The section of Manley relied upon by the Examiner discloses that the fuse layer is formed from an aluminum alloy, a copper alloy, or other metal alloy. (See, Manley, col. 2, lines 28-32).

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 6,235,557 to Manley

Claims 1 through 5 and 7 through 8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Manley (U.S. Patent No. 6,235,557). Applicant respectfully traverses this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

The discussion of Manley is incorporated herein. Applicants respectfully submit Manley cannot teach or suggest every element of the presently claimed invention. As stated, the claim element "post-circuit repaired semiconductor device" affects the claimed structure. Applicants respectfully submit that Manley fails to teach or suggest every element of claim 1 of the presently claimed invention. Specifically, Manley fails to teach or suggest an "intermediate structure of a post-circuit repaired semiconductor device comprising at least one open fuse structure on the intermediate structure of the post-circuit repaired semiconductor device." Instead, Manley discloses that "[b]ecause the majority of the fuses in any memory **will not be blown**, it is desirable that they remain covered with a protective layer of oxide in order to provide a degree of mechanical and chemical protection." (Manley, col. 3, lines 2-5)(emphasis added).

Manley states that the structure, for example of FIG. 2H, **then** undergoes probe testing and circuit repair **by opening** fuses. (*Id.* at col. 6, lines 58-59). In other words, the structures disclosed in Manley are pre-probe tested intermediate structures and involve closed (*i.e.*, not blown or open) fuses. Manley does not inherently or expressly disclose that his post-circuit repaired structure would be the same or an equivalent structure to the presently claimed

invention. As stated in the current application, when a conventional fuse is opened or “blown,” the metal or polysilicon will rapidly heat up and vaporize causing the vaporized material to be scattered and deposited, potentially proximate the blown ends of the open fuse. (Specification, paragraph [0004]). Nothing in Manley indicates that his fuse would operate other than convention.

As Manley fails to teach or suggest every element of claim 1 of the presently claimed invention, Manley does not render claim 1 obvious. Accordingly, claim 1 is allowable.

Claims 2-5, 7, and 8 are each allowable at least for depending, either directly or indirectly, from allowable claim 1.

Claim 2 is further allowable because Manley does not teach or suggest that the metal feature is electrolessly plated. Manley merely discloses that “the final metal layer is deposited and patterned.” (Manley, col. 5, lines 50-53). Manley lacks any disclosure of an electroless plating solution or related process.

Claim 5 is further allowable because Manley does not teach or suggest that the metal feature comprises a nickel, palladium, gold, tin, silver, or copper feature. The section of Manley relied upon by the Examiner discloses that the fuse layer is formed from an aluminum alloy, a copper alloy, or other metal alloy. (See, Manley, col. 2, lines 28-32).

Obviousness Rejection Based on U.S. Patent No. 6,235,557 to Manley, as applied to claim 1 above, in view of U.S. Patent No. 6,335,626 to Motulla

Claim 6 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Manley (U.S. Patent No. 6,235,557), as applied to claim 1 above, in view of Motulla (U.S. Patent No. 6,335,626). Applicant respectfully traverses this rejection, as hereinafter set forth.

The discussion of Manley is incorporated herein. Motulla teaches a method and device for determining a parameter to produce raised contact metallizations with uniform morphology on terminal areas of a test substrate. (Motulla, Abstract and Col., lines 6-9). A test substrate is placed in a metallization bath and the parameter is determined from variation in an electrical quantity as a consequence of electrical contact resulting from the buildup of contact metallizations on the terminal areas. (*Id.*, Abstract and Col. 1, lines 34-40). The metallization

bath is a nickel bath that forms nickel contact metallizations on aluminum terminal areas of the test substrate. (*Id.* Col. 4, lines 62-66).

The Court of Appeals for the Federal Circuit has stated that Adependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious.@ In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP ¶ 2143.03. Having failed to teach or suggest each and every limitation of the current application, the prior art referenced as rendering dependent claim 6 obvious, cannot serve as a basis for rejection.

The proposed combination of Manley and Motulla fails to teach or suggest every limitation of claim 6. As stated, Manley fails to teach or suggest "intermediate structure of a post-circuit repaired semiconductor device comprising at least one open fuse structure on the intermediate structure" as recited in claim 1 from which claim 6 depends. Nothing in Motulla teaches a fuse. Therefore, the proposed combination of references fails to teach or suggest every element of claim 6 of the presently claimed invention. As such, claim 6 is allowable.

CONCLUSION

Claims 1-8 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, the Examiner is respectfully invited to contact Applicant's undersigned attorney.

Respectfully submitted,



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